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Nexus Between Economic Development and Population: Empirical Evidence from Pakistan

Khawar Afreen[1], Afaq Ali Khan[2], Muhammad Wajid Khan[3]

[1] Ph.D. Researcher, Department of Economics, Statistics and Finance, University of Calabria, Italy.
Email: khawar.afreen@unical.it
[2] Assistant Professor, Department of Economics, Mohammad Ali Jinnah University, Karachi, Pakistan.
Email: afaq@jinnah.edu
[3] Research Scholar, Department of Economics, Mohammad Ali Jinnah University, Karachi, Pakistan.
Email: mwajidkhan@gmail.com

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ABSTRACT

The article explores the real-world connection involving population increase and economic development in Pakistan. This research examines the long-run and short-run implications of demographic parameters like population expansion, expectancy of life and fertility rate on the advancement of the Pakistani economy. The theoretical foundation of the study is built on demographic change, which takes into account life expectancy and the birth rate in the production function, as well as human capital development to establish research goals. The current study used Pakistan's time-series information from 1981 to 2021. The dataset was retrieved using the World Development Indicator engaging the Auto Regressive Distributed Lag model (ARDL) to figure out the short and long-run interactions between prosperity and population increase. The outcomes demonstrate an adverse and substantial association between the expansion of the population with the growth in the economy. On the contrary, life expectancy has a large and favourable impact on the development of the economy. According to the results, population growth has a detrimental impact on the development of the economy; nevertheless, appropriate usage of these assets must be made. Whenever a nation maintains an extensive population and fails to utilize its strength effectively, then it will become a strain on the economy. The authorities ought to implement comprehensive strategies for improving employment opportunities in the entire nation. Though Pakistan possesses an intelligent workforce, the challenge remains how to harness its potential profitably.

Corresponding Author's Email: khawar.afreen@unical.it
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1. Introduction

According to numerous research works, the population is an essential component in industrialized nations' economic prosperity (Todaro & Smith, 2003; ul Mustafa & Nishat, 2019). The population can additionally be described as the accessibility of individuals, regarded as the most important component in the prosperity of any country. Simon (2019) considered growing

populations instead of being the primary cause of a scarcity of resources from nature, but as a solution for a considerable number of financial disasters, given that people fuel financial development and advancement. However, if this asset fails to be utilized properly, population growth will provide a significant challenge to emerging countries. Various economists analyzed the increase in population that population growth would stimulate advances in technology which would allow nutrition development to remain conscious of building the population or which larger populations would result in thoughts that might be utilized in addressing any financial problems that might come out (Bartlett, 2015; Boserup, 1965; Mansha, Yang, ul Mustafa, & Nasim, 2022; Rehman, Abro, Mustafa, Ullah, & Khattak, 2021).

The enthusiastic discussion regarding the relationship between both of these elements is essential across all countries, regardless they are experiencing an economy that is struggling, an advanced economy, or an emerging economy. Many studies have been discussed. The fundamental theory states that human population expansion stimulates economic progress. Some researchers view population increases as simply a phenomenon that has a detrimental influence on economic progress (Menike, 2018). Population expansion could have a detrimental impact on the growth of the nation (Todaro & Smith, 2003). The majority of its assets were spent on expanding the population, which immediately puts pressure on a country's scarce resources. Hence, gaining an understanding of population increase and monetary growth is vital.

Investigating the relationship involving economic progress and population expansion yields no precise conclusions (Easterlin, 1974). This can vary from area to territory and location to location; in certain circumstances, studying historical events might not prove relevant to future events. Population and fiscal stability issues are nearly as old as economics themselves. Arguments regarding the relationship involving population expansion and economic progress began in 1798. Based on Malthusian theory, population growth tends to surpass economic expansion because the population grows at a geometrical rate while food growth follows an arithmetical pattern. In the long-term, the necessary quantity of nutrition will eventually become inaccessible to the growing population; to preserve the equilibrium in population and availability of food, a thing takes place, such as disease, hunger, situations of crisis, warfare, and so on (Malthus, 1986). The neoclassical Solow (1956) Solow growth model gives a potential clarification for the adverse causal connection between population expansion and economic progress. Samuelson (1975) declared human population extension could alter the principle of diminishing returns, jeopardizing future generations' welfare. According to Boserup (1965), significant population expansion increases the pressure to make use of available resources more efficiently and rapidly to provide people with food and other essential commodities. The second model is known as the "Household Theory of Fertility". Based on this concept, a person can choose the quantity of children to "consume" as part of the goal of maximizing utility problems. Children from less developed countries (LDCs) might be viewed as investment goods (Todaro & Smith, 2003; ul Mustafa, Abro, Hussain, & Ali, 2021).

As stated by demographic economists, three distinct groups of thinking exist, discussing the connection between the increase in population and the development of the economy. Among these, the first group endorses the Malthusian hypothesis, which states that rapid population growth slows progress in the economy and increases poverty. Another group, the Revisionists, believes that increasing population increases the value of human development, consequently adding to the nation’s economic progress. Ultimately, the theory of transition provides that an increase in population is influenced by changes in pay; i.e., overcrowded countries have increased populations due to economic limitations (Darrat & Al-Yousif, 1999).

Economists from different times have reached varied findings over the years concerning the impact of population expansion on economic expansion (Finkle & Crane, 1975). The sociologists and economists who support growing populations have made three declarations: first while increasing the population is not something that needs to be discussed, countless

other issues influence economic prosperity. The second aspect is to put nations that are developing in a disadvantaged position while industrialized countries employ population control strategies. Third, demonstrates that population expansion is critical to the development of many emerging nations' economies (Todaro & Smith, 2003).

This took generations for the population of the world to stretch out to one billion people, and this growth is expected to rise seven times during the 200 years that follow. By 2011, the world's population amounted to seven billion cards. The present-day world population is 7.95 billion in 2022 (WDI, 2022).

The research effort concentrates on Pakistan to assess the impact of the growing population on economic performance. Pakistan has a vast population. Pakistan will undoubtedly make a significant investment in this population mass. Based on the 6th annual report provided by the Pakistan Bureau of Statistics, Pakistan's population remains over 200 million, accounting for roughly sixty per cent of the total population recorded in the 1998 statistics. the nation's yearly increase in population was 2.4%, making it higher among numerous nations worldwide. Pakistan's population was 208.57 million in 2020, with a total number of 241.49 million estimated for the 2023 census (PBS, 2023).

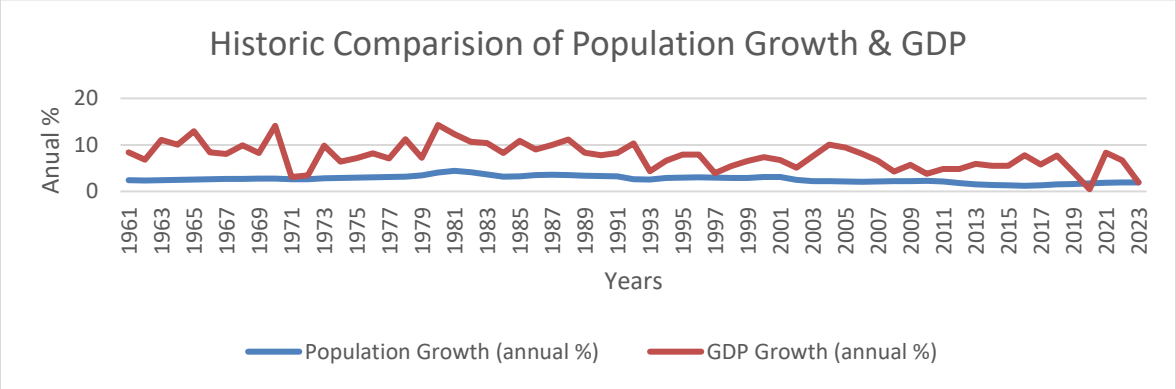

Figure 1: Historic Comparison of Population Growth (% annual) and GDP (% annual)
Data Source: World Development Indicators (WDI)

The main objective of the research is to assess the key effects of Pakistan's rising population on its economic growth, using demographic data that is also related to this research. Pakistan confronts a major increase in population challenges. This constitutes a direct challenge to the authorities. Increased growth in population causes an increase in the sheer quantity of employed individuals. When labor is used productively, prosperity will no longer be an obstacle (Khalique & Khan, 2021).

2. Review Of the Literature

Several experts, including demographers and economists, have investigated the relationships between economic development and population expansion (Menike, 2018; ul Mustafa, Nishat, & Abro, 2022). Their study showed the influence of growth in population on evolution and was mainly concerned with both negative and positive visions. The positive perspective of scholars favours population growth, which means that restricting the population of a country is not necessary, and the contradicting perspective emphasises the reduction of population for an appropriate state of development.

MEC and ČERMÁKOVÁ (2024) analyzed population and economic growth per capita in 30 African nations from 1960 to 2020. Using the Bootstrapped Panel Granger Causality assessment, the estimated results reveal that fifty per cent of the nations exhibited no

causality, while the other half showed varying levels of significance. As a whole, the findings contribute to the body of data supporting the endogenous growth in population hypothesis, implying that the causation among these two factors is determined by the country's environment.

Munir and Shahid (2021) researched panel data for four South Asian countries from 1980 to 2018. A favourable relationship was identified by the researchers for the relation of growth in the economy, fertility rate, real capital stock and life expectancy, whereas economic growth decreases due to a rise in the young dependency ratio in Southern regions of Asia in the long run.

Azam, Khan, and Khan (2020) want to put the Kremer and the Malthusian theories under examination by investigating the link between growth in population and the GDP in India's middle- and low-income economies. From 1980 to 2018, the approach known as ARDL was used, with economic expansion as the regressand and the growth in population rate, inflation rate, life expectancy, and investment, as the regressors of economic growth. Population expansion, according to the findings, exerts a large and favourable influence both on short and long-term economic development.

Sebikabu, Ruvuna, and Ruzima (2020) inspected the results of ARDL, which showed the statistically significant and positive influence of population gain on the development of the economy. In Rwanda, during the years 1974-2013, the economic growth was not impacted by population growth significantly. The study emphasizes that policymakers hold control of economic development the population growth.

Lee and Shin (2019) employed panel information from 142 nations between 1960 and 2014, to examine the impact of human population ageing on the growth of the economy. They find that the rate of population ageing, reflected by the old-age population share (or old-age dependence ratio), hurts economic development when it crosses a particular threshold, while the adverse effects become larger as population ageing progresses. Researchers additionally discovered how population ageing has impeded growth in economies in the past few decades, particularly in older nations, the majority of those that have industrialized.

Furuoka (2018) showed how population expansion could have been damaging to economic expansion in the future, as well as a bi-causal connection was identified, implying that an increase in population constituted both the cause and effect of economic progress in China from 1961 till 2014. Alvarez-Dias, d'Hombres, Ghisetti, Pontarollo, and Dijkstra (2018) examined the relationship between the development of the economy and the population for the period of 1960 to 2010 for the EU28 which contributes to the existing empirical literature. Study results revealed the two-dimensional and the optimistic co-relation in population and GDP per Capita. Initial observation of the result verifies that economic circumstances are the main concern in framing population growth.

Peter and Bakari (2018) studied the economic growth of Africa. Their research analyzed that population growth impacted positively while fertility affected negatively on the economic upturn of Africa. The study summarized the idea that African countries should endorse pragmatic policy measures which will help to enrich the production capacity of the population to achieve further demographic dividends.

Peterson (2017), investigated the factual information based on 200 years, to create the links between the increase in per capita output, and population growth with worldwide growth in the economy. The interpretation reveals the pressure of population economic gain in Rwanda from the period 1974-2013. Countries bearing high incomes and having less population growth rate face issues related to society and economy, on the contrary, the slow development observed in the countries with low incomes integrating with large populations. The imbalances

could be stabilized by global migration but don't get fair support from several researchers. Analysis based on economic inequality interprets that the increase in the economy is caused by less growth in population and constrained migration.

Nyoni and Bonga (2017) focused on decoupling the influence on the economy of Zimbabwe by population growth. The outcomes of the model indicated the significant and positive hold of population growth on the economy as well as exports, inflation rate, interest rate and FDI (foreign direct investment), which also adds to the significance of the economic growth of Zimbabwe. Fumitaka (2016) study shows a feasible significant relationship between the extension of population and economic upturn. Outcomes reveal a positive significant connection between the variables that contrast with the favorable beliefs. The conclusion interprets that the growth of the economy is not deleterious in the region and can gain benefit by growth of population.

Kato (2016) proposed the study of an experimental analysis of technological progress and population in Japan which drives a positive relationship between population growth with multi-factor productivity (MFP). The study takes the multifactor productivity as a technological progress. Essen (2016) studied, how the Nigerian economy is affected by population growth. The results show that population growth positively affects the Nigerian economy. However, the ample human resources conditions are inadequate and not able to nourish economic growth.

Rodriguez, Chatterjee, and Rasio (2016) focused on the relationship between population expansion and the economy in Mexico, which reveals that in the short run result, economic growth negatively affects the growth of the population, while in long-run result, gross domestic product (GDP) per capita positively affected by population. ZHANG (2015) enlightened the fact that a few underdeveloped states, such as India, China and Indonesia, face unfavourable effects on the economy of population growth. The hurdles exist because such developing regions are overpopulated and lack with resources that are needed to produce skilled workers.

Peter and Bakari (2018) observed the relationship between growth in the economy and the population growth from the years 1980 to 2010 in Nigeria. The result showed that a favourable relation between population increases and economic growth contradicts developed nations. Mierau and Turnovsky (2014) explain the population increment derived as lessening rates of death reflecting growth in the economy while an increment in fertility affects the population growth will moderate conventionally.

Ali, Ali, and Amin (2013) worked on the relationship between population expansion and growth in the economy in the context of Pakistan. The study revealed that growth in the economy was positively affected by the increase in population. Yao, Kinugasa, and Hamori (2013) presume that total-factor-productivity, degree of industrialization and savings rate, bear a positive significant influence on GDP per capita. On the other hand, population provides a negatively significant influence on GDP per capita. This research interprets the vision that GDP per capita has not been significantly affected by the proportion of the population who are employed as a proportion to the total population.

Afzal (2009) identified an adverse impact of the population on the economic development in Pakistan. Results prove that a negative relationship exists between population growth and economic development. Yao et al. (2013) analyzed Chinese data and formed an opinion on how economic growth is affected directly and indirectly by population and technical change. The results revealed that the population's indirect effect is favourable and the direct effect is not favourable, and the absolute value of the indirect effect is more than that of the direct effect. The conclusion by the researcher enhanced the idea that progress in technology is supported by population growth and also contributed to Chinese economic growth indirectly.

Reviewing the literature clarifies the idea that different researchers have given different views in their investigations about how economic growth is influenced by population growth. Some researchers strongly support the vision that the development of the economy is adversely influenced by population increment on the other hand some researchers oppose this idea and emphasise the positive correlation between population and economic growth. A re-evaluation of the text is needed due to differences in opinions about the strong association between population and economic growth. Although the study about the population advancement and economic growth in Pakistan is insufficient, therefore this analysis keenly concerns the dimensions and time frame, which contribute significantly to research, unlike earlier studies.

3. Methodology

Growth in the economy is defined as an increase in the value contributed to an economy during a certain year, quarter, or period. Several economic analysts considered this topic which significantly supported modern studies (Kelley & Schmidt, 1999; Kuznets, 1967; Simon, 2019). For defining economic growth, many theories considered the formative role of demographics (Thompson, 1930).

3.1. Background of the Model

From 1900 to 1926, the relation of total output with capital and labor was analyzed by the Cobb-Douglas production function. To start, Knut Wicksell used the same functions from 1851 to 1926 (Alezzee, 2010; Wicksell, 2016). The discussion can be interpreted by Cobb–Douglas production function, which is represented below;

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha} \quad (1)$$

Every variable is an expression of time. The parameter α represents the capital share, whereas 1-α represents the labor portion. The term 'A' refers to technical development, whereas K represents the fraction of capital cost in creating GDP and L represents the labor force.

Population increase and economic development have a tangled relationship. However, a growing population suggests an increase in the supply of labor, which has become a key factor in productivity. According to previous research, a rise in population and supply of workers constitutes one of the primary drivers of prosperity. The hypothesis to find the nexus between the development of the economy and the increase in population for this research will be as follows;

H_0: Pakistan has no substantial connection between population increase and GDP growth.
H_1: Pakistan has a significant connection between population increase and GDP growth.

3.2. Research Model

Data in this research has been taken from the World Development Indicator (WDI) since 1981 till 2021. The model used in this research was extracted from the models of (Acemoglu & Johnson, 2007; Afzal, 2009; Ali et al., 2013; Bloom & Canning, 2004; Menike, 2018; Munir & Arshad, 2018; Munir & Shahid, 2021; Peter & Bakari, 2018). The response variable is GDP per capita, while explanatory variables consist of population growth, fertility rate, and life expectancy;

$$GDP_t = f(POG_t, FER_t, LIE_t) \quad (2)$$

The econometric model for this research will be in the form;

$$GDP_t = \beta_0 + \beta_1 POG_t + \beta_2 FER_t + \beta_3 LIE_t + \mu_t \quad (3)$$

A natural logarithm is then fitted to the aforementioned model. Natural-log coefficients are capable of being easily read as substantially equivalent variations, such as percentage or unit shifts.

$$lnGDP_t = \beta_0 + ln\beta_1 POG_t + ln\beta_2 FER_t + ln\beta_3 LIE_t + \mu_t \quad (4)$$

Where; GDP represents GDP per capita; POG is Population Growth; FER shows the Fertility Rate birth per woman and LIE stands for Life Expectancy. 'μ' is the error term and subscript 't' is the series of time.

4. Results and Explanation

4.1. Statistical Description

Statistical description provides an interpretable description of the data under research.

Table 1
Descriptive Statistics

	LNGDP	LNLIE	LNPOG	LNFER
Mean	7.025943	4.131257	0.892050	1.622904
Median	6.964344	4.133902	0.939443	1.633740
Maximum	7.408950	4.201044	1.486846	1.902704
Minimum	6.645198	4.061339	0.185696	1.244155
Std. Devi.	0.213424	0.042946	0.336641	0.216685
Skewness	0.131945	0.114249	-0.405917	-0.188547
Kurtosis	2.090426	1.613964	2.240638	1.623347
Jarque-Bera	1.532310	3.371065	2.110996	3.480512
Probability	0.464797	0.185346	0.348019	0.175475
Sum	288.0636	169.3816	36.57404	66.53906
Sum Sq. Dev.	1.821991	0.073775	4.533084	1.878097
Observations	41	41	41	41

*Author's Estimates

Results of Table 1 show that the median and mean values of all variables appear to be the same, indicating that data follows a normal distribution and that no outliers exist. Similarly, the maximum and minimum values of the investigated data set are closer, implying that the data has a strong clustering and no indication of outliers. While observing the values of standard deviation in the table, it can be said that the variation among the data set is minimal. Values of skewness and kurtosis in Table 4.1, clearly indicate that GDP and life expectancy are positively skewed but population growth rate and fertility rate are negatively skewed, following platykurtic. By observing values of probability for the Jarque-Bera test, it can be said that all variables follow a normal distribution.

4.2. Selection of Model

Data follows the time series pattern; therefore, the stationarity of each variable was checked. The augmented Dickey-Fuller (ADF) test was employed for this purpose.

Table 2 provides the details that GDP and life expectancy get stationary at 1st difference while growth of population and rate of fertility are stationary at I(0). Therefore, the regressive Distributed Lag (ARDL) model is applied.

Table 2
ADF Results

	Level		1st Difference		Level of	Order
	t-stats	p-value	t-stats	p-value	Significance	
LnGDP	-0.254449	0.9227	-4.500088	0.0009	1%	I (1)
LnPOG	-3.953377	0.0194	-	-	5%	I (0)
LnFER	-2.079536	0.0375	-	-	5%	I (0)
LnLIE	-2.199106	0.4771	-2.771732	0.0069	1%	I (I)

*Author's Estimates

4.3. Lag Length Selection for ARDL Model

Optimal lag length offers a more accurate view of which amount of lag time ought to be employed. Therefore, the Vector Autoregressive (VAR) model was applied.

Table 3
VAR-Lag Order

Lag	Log L	LR	FPE	AIC	SC	HQ
0	246.5159	NA	3.36e-11	-12.76399	-12.59162	-12.70266
1	443.1328	341.4925	2.52e-15	-22.27015	-21.40826	-21.96349
2	472.4543	44.75390*	1.29e-15*	-22.97128*	-21.41988*	-22.41930*
3	486.8241	18.90768	1.52e-15	-22.88548	-20.64457	-22.08818

*Author's Estimates

According to Table 3, all criterion shows that the lag value should be taken as 3.

4.4. Bound Testing and ARDL

Bound testing reveals the question of whether the variables have a long-run connection. The null hypothesis for the investigation argues that there doesn't exist cointegration. Based on conceptual comprehension, the estimated value of F statistics is more than the upper bound, the null hypothesis must be rejected. In Table 4, the value of F calculative is higher than the upper bound, implying that co-integration occurs or that there is a long-run link.

ARDL results obtained in the selected model provide the values of R-squared 0.994886 and adjusted R-squared 0.993731, which interprets that the model is in good fit condition with minimum error sum of square. The standard error of the regression also very verifies the stability of the model by a minimum value of 0.015910. Durbin-Watson stat provides the existence of auto-correlation in the selected variables. The value of this stat lies between 0 to 4 and the acceptable range is from 1.5 to 2.5. here the value is 1.899215 which is in the acceptable range which proves that auto-correlation does not exist in the selected variables.

Table 4
Bound Testing

Test Statistic	Values	Sig. Level	I(0)	I(1)
F-statistic	14.25875	10%	2.01	3.1
k	3	5%	2.45	3.63
		2.5%	2.87	4.16
		1%	3.42	4.84

*Author's Estimates

4.5. Short Run & Long Run Test

Table 5 provides the results for the short run of the ARDL model. In the short-run results, the independent variable; Life Expectancy has a significant and negative effect on GDP at first lag. For the population, this effect is significant and positive at first lag. On the other hand, the Fertility Rate of birth per woman does not affect GDP. The coefficient of error term was determined to be -0.293862. It is additionally referred to as the speed of integration, how long a scenario requires to return to normal after receiving an unexpected event. In this instance, the number is -0.293862, the low value and inside the specified limit, and the equation will update monotonically.

Table 5
Short Run Coefficient Result

Variables	Coeff.	Std. Err.	t-Stat	Prob.
D(LNLE)	0.032231	0.453651	0.071049	0.9438
D(LNLE(-1))	-1.114856	0.487597	-2.286428	0.0292
D(LNPOPG)	-0.048252	0.032493	-1.485007	0.1476
D(LNPOPG(-1))	0.088795	0.037694	2.355657	0.0250
CointEq(-1)*	-0.293862	0.037155	-7.909142	0.0000

*Author's Estimates

Table 6 results indicate the long-run outcomes for the ARDL model. It confirms that there is a significant and favourable relationship between Life Expectancy and GDP. While the growth rate of the population provides a significant and negative impact on GDP. While the fertility rate of birth per woman does not affect the dependent variable.

Table 6
Long Run Coefficient

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNLIE	1.817579	0.033782	53.80268	0.0000
LNPOG	-0.369950	0.102926	-3.594326	0.0011
LNFER	-0.046811	0.143101	-0.327121	0.7458
EC = LNGDP - (1.8176*LNLIE -0.3700*LNPOG -0.0468*LNFER)				

*Author's Estimates

Furthermore, the statistics demonstrate that if life expectancy is raised by 1%, the GDP would increase by 1.817579%. Increased life expectancy contributes to an increment in the population which is working-age, hence streamlining the economy in the long run. Good healthcare facilities lead to an increased life expectancy. Furthermore, increasing population growth by 1% will result in a 0.369950% fall in GDP.

4.6. Diagnostic Test

Serial correlation occurs when error terms spanning different periods are connected. While heteroskedasticity occurs when the variation in the values of the error term is unevenly distributed. On the other hand, to test the specification error of the selected model, the Ramsey test is used. This test also checks whether the model omits any important variable or not.

According to the Breusch Godfrey Serial Correlation LM Test and the Breusch Pagan Godfrey test for heteroskedasticity, if the value of the probability of R square surpasses 0.05, there will be no serial correlation or heteroskedasticity. The value of probability for the observed R-squared in the two tests is larger than 0.05. As a result, the model exhibits no serial correlation or heteroscedasticity. If the values probability for t-stats and F-stats are less than 0.05, then there should be a specification error in the model. Table 4.8 provides that the

values of probability are above 0.05 which proves that there is no specification error in the selected model.

Table 7
Breusch Godfrey Serial Correlation (LM), Breusch Pagan Godfrey and Ramsey Reset Tests

Diagnostic Test	Statistics
Serial Co-relation (LM test)	0.138066
	(0.8716)
Heteroskedasticity (BPG test)	1.34863
	(0.2587)
Ramsey Reset test	0.624045
	(0.4357)

4.7. Stability Test

The CUSUM and CUSUMSQ tests have been widely accepted as exemplary approaches for identifying structural shocks in time series modelling. For checking instability in the intercept, CUSUM test is used, whereas the CUSUM-square test reveals instability in the regression error variance.

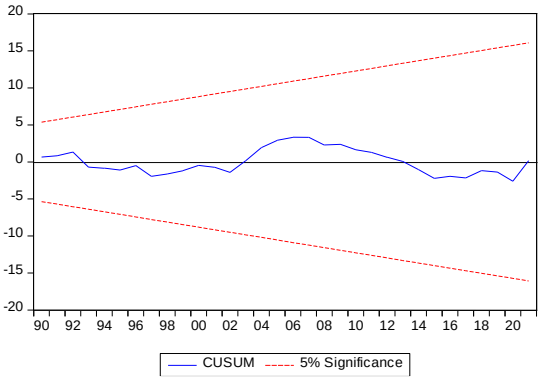

Figure 1: Model Stability (CUSUM)

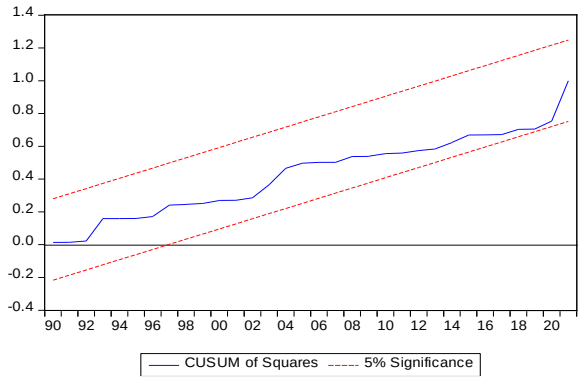

Figure 2: Model Stability (CUSUM of squares)

The above figures illustrate how the estimated lines are within the critical lines or limit at the 5% level of significance. Hence, the design is structurally robust.

5. Conclusion and Implications

The population is an important factor in the growth of a nation's economy, and it impacts its financial stability in a variety of ways. Pakistan's population plays an important role in defining global statistical trends. The major purpose of evaluating the research is to conduct a quantitative examination of the relationship involving population increase with economic development in Pakistan. The study examines the long-term and short-run effects of socioeconomic variables such as population growth, life expectancy and fertility rate on Pakistan's economic development.

5.1. Conclusion

The statistical analysis of the investigated factor, the population growth reveals an adverse and considerable impact on the economy in both the short and long term. The fertility rate has no effect on economic development in the short or long run. When evaluating life expectancy, it was discovered that this factor had a substantial and beneficial association with the response factor, i.e., GDP.

Overall, the findings of the investigation support the idea. The fitted model's outputs are highly predictable ahead of time. According to the research, Pakistan's population is a significant barrier to economic progress. If population growth is not regulated, the country's economy will suffer. In general, the nature of the population in emerging nations has remained extremely risky throughout the last many generations. Pakistan has been one of the countries whose population growth has reached an alarming level in the past few decades. Furthermore, Pakistanis are unaware of the consequences of having a large family including the associated costs. Long-term plans to reduce population expansion have not yielded results. As a result, population increase has become a significant challenge, slowing Pakistan's economic progress. Based on this research, population growth has a detrimental impact on growth in the economy, although appropriate use of this valuable asset is required.

5.2. Implications

Whenever a country maintains a high population yet fails to utilize its strength effectively, then it will be a strain on the nation. The authorities of Pakistan ought to develop persuasive plans for tackling the issue of overpopulation. In this sense, the level of employment must be improved to maximize the use of human capital and positively affect the development of the nation. The measure is tied to a country's industrialized and agricultural production, and as that component increases, so does the GDP. Increased fertility rates are another element to consider. As more than the initiatives taken by the government alone are required, collaboration between the public and private sectors may help. A constructive way to reduce fertility could be for the governing body to enact enough laws to extend mandatory and free schooling at the basic and secondary grades. It is intended to educate parents on the dangers of excessive population density.

Increased economic growth generates greater tax revenue, allowing government agencies to invest greater amounts in public institutions like health and educational initiatives. It could allow for greater standards of living, including increased literacy rates, longer life expectancy, greater financial options, and a clear grasp of both political and non-political issues.

Author's Contribution:
Khawar Afreen: Conceived and designed the analysis and wrote the paper.
Afaq Ali Khan: Contributed data analysis and Model specification.
Muhammad Wajid Khan: Data collection and formatting the paper.

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